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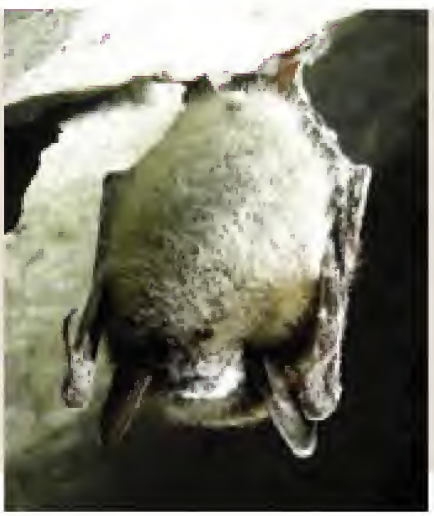
Bat Fungus Takes Its Toll on the Little Guys

In early 2006, a caver noticed and photographed what appeared to be a fine white mass on bats in Howe's Cave in New York. Within a year biologists at the New York State Department of Environmental Conservation documented the condition and gave it the name "white-nose syndrome" (WNS) because the fine white fungal mat appeared around the faces of some bats. In fact, the fungus was found to have invaded deep into the skin and wings of many bats. WNS appears to be responsible for killing large numbers of bats. In some caves the losses are between 90 and 100 percent!

The white-nose syndrome has subsequently been identified in other northeastern states: Connecticut, Massachusetts, Maine, and Vermont. This winter WNS was confirmed in New Jersey, Pennsylvania, West Virginia, and Virginia. Recent news reports state that the fungus has been found on bats in the state of Delaware. In an effort to halt or at least restrict the spread of the fungus among bats, the United States Forest Service, Department of Agriculture, and the Fish & Wildlife Service, Department of the Interior, have closed thousands of caves and abandoned mines (where bats are known to hibernate) located on federal lands and requested a voluntary moratorium on recreational activities in caves in 17 states. (*Continued on page 7*)

Above right: Close-up of white-nose syndrome. Photo provided by Marc Bosch, U.S. Field Service (Department of Agriculture).

Right: Little brown bat at Greeley Cave, Vermont with white-nose syndrome, March 26, 2009. Photo by Marvin Moriarty, U.S. Fish and Wildlife Service (Department of the Interior).



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FROM THE PRESIDENT

It's been a year of changes for NAMA. Our website has been updated and greatly improved thanks to our webmaster, David Rust! Many new faces are being seen at trustee meetings and forays. Several officers were elected at this years trustee's meeting, and some committee chairs changed.

One change that I had not expected was the resignation, for personal reasons, of NAMA's Executive Secretary, Judy Rogers. Judy has served in this important position in an exceptional manner for some years and has assisted NAMA for decades in many capacities, including editing The Mycophile for several years. I've been a NAMA member for well over twenty years, and I know she was serving when I joined! The thanks and gratitude that we owe to Judy for her decades of service cannot be overstated. I know that she will continue to be involved and as always volunteer where needed. Thank you, Judy!

In a way, I know how Judy must be feeling. January will bring an end to my service as an officer of NAMA: nine years as treasurer and six years as president. There are many things which I will miss; but I must admit that it will be nice to attend a national foray and do nothing more than hunt mushrooms and attend seminars. The memories and experiences of the past fifteen years are numerous, and some are unforgettable. The greatest thing about volunteering as a NAMA officer or trustee is, without a doubt, getting to know the others who serve. Lifelong friends are made across the country; and through the forays you get to see areas of this beautiful country which I suspect you'd never venture into otherwise. Thanks to NAMA, I can say that there is probably a friend who would take me in (briefly I'm sure) from California to New York to Alberta, and these friends are welcome here in North Carolina.

For anyone who is interested, I strongly recommend that you consider becoming involved at the management level of NAMA. It's a wonderful experience. And as you know, mushroom people are the best people in the world. —*Ike*

Albert, Canada, Has an Official Mushroom

As a result of a bill proposed by Carl Benito in March of this year, Alberta has adopted an official mushroom: the *Leccinum boreale,* also known as the red cap or the northern roughstem (see photo on page 3). This wild edible mushroom is found across Alberta.

The designation did not take place overnight. In fact, the Edmonton Mycological Society first developed the idea for a competition to select a wild mushroom in the spring of 2004. Under the able leadership of Melanie Fjoser, a committee was created to solicit and tally votes for "Pick a Wild Mushroom—Alberta." By the summer of 2005, when the spores had settled, almost 3,000 votes had been cast. It was a close race among *Leccinum boreale, Pleurotus ostreatus, Hericium ramosum*.

The *Leccinum boreale*, a member of the family Boletaceae, won the election and the designation. It has an orange-red cap and a rough stem (tufted hairs or scabers), hence its common names. The stem is wider at the bottom than the top, but it is without volva or veil. The spore print is yellow-brown to dull cinnamon or medium brown. The habitat is varied from deciduous or conifer forest clearings to high grass.

(*Continued on page 3*)

Moving?

Please send your new address, ***two weeks*** before you move, to

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61 Devon Court
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Otherwise—you may not be getting your newsletter for a while. Each issue, several *Mycophiles* are returned as undeliverable because of no forwarding address on file. NAMA is charged ***seventy cents*** for each returned or forwarded newsletter.

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Foray in California

13th Annual SOMA Wild Mushroom Camp, Jan. 16–18, Occidental, CA

SOMA Camp is an annual gathering of mushroom enthusiasts sponsored by the Sonoma County Mycological Association. This three-day event is packed with activities: mushroom identification, cooking, dyeing, polypore paper-making, medicine making, photography, cultivation, and much, much more!

For this year's SOMA Wild Mushroom Camp the theme is "Trees and Mushrooms." Guest speakers include mycologists Tom Bruns and Tom Volk. More information and the registration are available at the SOMA website: www.somamushrooms.org/camp/camp.html.

Fungi and the Stradivarius

The Swiss Federal Laboratories for Materials Testing & Research (EMPA) scientists have been experimenting to determine the effects of fungal modification of wood. EMPA scientists infected sterilized pieces of wood with various wood-decaying fungi. They found that the cell walls of the wood were thinned, but the firmness was not changed.

The EMPA scientific team, headed by Professor Doctor Francis Schwarze, used *Physisporinus vitrius* to infect a piece of Norway spruce and *Xylaria longipes* to infect a piece of sycamore. Then a professional violin-maker, using a lengthy, hand-worked process, made the wood into the top and bottom of a violin's sound box. Two violins were made with the fungal-modified wood and two identical violins were made from unmodified pieces of wood.

These four violins, along with a Stradivarius violin, were played before a group of almost 200 individuals during the annual forest husbandry conference (27th Osnabrücker Baumpflegetagen) in September in Germany.

The group selected one of the violins made from fungally modified wood as having the "best" tone. Although tonal quality is subjective, and the methodology of the test could be questioned, the value of mycological research has reached into our lives yet again. The advent of "biotech" violins may be upon us.

Leccinum boreale, photographed by John Plischke III at the 2006 NAMA Foray in Edmonton, Alberta.

Alberta's Mushroom, cont. from 2

Alberta's new emblem can be appreciated in the wild or enjoyed in the pot. It can be dried, cooked and frozen for use later, or cooked fresh and enjoyed right away.

EDUCATION PAGES

by Sandy Sheine, NAMA Educational Coordinator

Most teachers, including biology teachers, have been taught very little about fungi and there are very few pages in biology textbooks devoted to the fungi kingdom. As professional and amateur mycologists, we can make a great contribution to science education by offering to teach about mycology to K–12 classes and in nature centers. We can also offer classes for teachers and naturalists to help them teach about fungi. Here is an easy Lesson Plan to help you become a teacher of accurate fungi information by using the materials for teaching about fungi from the NAMA website. I would love to hear from you so we can share our knowledge and experiences. Questions and comments are welcome; contact me at ssheine@aol.com.

Lesson Plans for Teaching about Fungi

This is a suggested introductory lesson plan for teaching fungi to K–12 classes in schools and nature centers. The length of school classes is generally 45–60 minutes; your lesson should cover that time frame.

Objective: To learn about the basic characteristics of the Fungi Kingdom.

Materials:

- Selections from the NAMA website: ww.namyco.org/education.

  Under ***Materials for Teaching Mycology,*** click on ***More about Teaching Mycology*** (at the end of the paragraph) for the contents of the ***Manual of Instructional Materials for Teachers and Naturalists Teaching about Fungi: Grades K–12 and College.*** All materials may be downloaded free for educational use only.
- "How Mushrooms Grow," Grades K–12 (to present in front of group).
- Use the following as handouts for the appropriate Grade level:

  "Questions about Fungi," Grades K–3.

  "Questions about Fungi," "There's Fun in Fungi," Grades 4–12.

  "More Questions about Fungi," Grades 4–12.
- Two tables.

  First table covered with newspaper for display of both fresh and dried fungi (about 30 species) separated into groups (gills, pores, teeth, polypores, other). Favorites are puffballs, earthstars and dead man's fingers.

  Second table for books, spore prints, hand lenses, dental mirrors, magnifying stand, and color wheel of wool samples dyed with fungi.
- Two 16" x 20" mushroom posters, such as "Poisonous and Edible Fungi" by David Arora (available on www.fungiperfecti.com.)
- Plain drawing paper and crayons or color markers.
- Drawing of mushroom picture in black and white for coloring. Grades K–3 only.
- Optional: microscope in classroom to look at microscopic features.

Lesson Plan:

- Prepare displays in classroom and set up projector before students arrive, if possible.
- Introduction of Presenter.
- Q&A period with students on why fungi differ from plants animals and what they have in common. Allay fear of touching mushrooms. 5 min.
- "Show How Mushrooms Grow," nine drawings about reproduction, types of fungi, how they obtain their food and their role in the environment. Presenter and class discussion of each drawing, with questions and feedback. 5–10 min.
- Presenter discusses the fungi specimens displayed on the table and passes around some hand lenses and fungi for the students to examine. 10 min.
- Teacher gives students the handout of questions to be answered for homework.
- Teacher divides the class in groups, with groups taking turns going around the two tables, handling the fungi, examining them with hand lenses or under the big magnifying lens on a stand, comparing the fungi to the posters and photos in books, looking at spore prints and asking questions. At their desks students can start answering the questions on the handouts, read one of the books on display, or color or draw fungi. 25 min.
- If there is any remaining time, the class can return to their seats and the Presenter will lead a discussion about the answers to the questions on the handout.
- If you are teaching more than one class during the day, ask the teacher for 15 minutes to set up the classroom prior to the first class. If you are moving from class to class, ask the teacher to choose some students to help you carry your materials. Since these students have just had the lesson, they should be able to help you set up the material quickly. Another option is to set up the material in the library, science center, or empty room, for the whole day and have the classes come to you. Yet another option is to set up the classroom during lunch while the students are off in the cafeteria.
- If there is more time after the lesson, or on another day, follow-up lessons and activities are offered in the files of the ***Manual of Instructional Materials for Teachers and Naturalists Teaching about Fungi*** on the NAMA website: www.namyco.org/education.

- There are choices for a walk in the woods or additional classroom activities.
- Please note that there are additional NAMA Education Resources at www.namyco.org/education, including:
  - Mushroom Teaching Kits,
  - Books for Young People,
  - Recommended Reference Books,
  - Programs for Loan,
  - Online Teaching Resources, and,
  - NAMA Speakers Bureau.
- This lesson can be adapted for older students or for adults with additional material from the NAMA website. Photos of mushrooms in different seasons can be shown. Simple keys and checklists are helpful, too.
- There is also a lot of teaching material written by Gary Lincoff on the NEMF website: www.nemf.org.

REVIEWS

Mushrooms, Forests, and Other Ecosystems is a new CD prepared by Michael Beug for the Education Loan Program on the NAMA website, www.namyco.org. The habitats for this 45-minute program are the forests and fields in the Pacific northwest where Michael lives, but the information is applicable to all the varied North American ecosystems. This is a very important and interesting topic that fills a niche in our programs by introducing the ongoing research that is being done on mycorrhizal (symbiotic) relationships between fungi and plants.

To identify mushrooms, most amateur mycologists use older mushroom books that were written before major research was done on mycorrhizae. Even the latest popular mushroom books devote little more than a paragraph to this topic. Michael recognized the need to give us an overview of mycorrhizal relationships. A fungus can form an ectomycorrhizal relationship with a tree that is beneficial to both partners. Michael describes how the fungal mycelium can transfer water, minerals, and other nutrients to the roots of a tree in exchange for the tree's providing complex carbohydrates for the fungus. Trees can change fungal partners, sometimes with the season, and can also have several different fungal partners at the same time. Genera—including Amanita, Lactarius, Russula, Cortinarius, Laccaria, Inocybe—are shown, and their edible and poisonous characteristics are included.

For example, the large oak forests in Oregon and Michigan are known to have had an association with Armillaria spp. for several hundred years. Endomycorrhizal relationships with plants such as grasses, flowering plants and herbaceous woody plants are also presented. In addition, fungi in the role of decomposers and parasites are included, along with their hosts, describing their relationship to diverse ecosystems. The role of lichens in the environment, such as indicating air quality, also is addressed. The importance of fungi such as truffles as food for animals is noted. Many beautiful photos of fungi are shown, including examples of both edible and poisonous species.

This CD is packed with so much information that you will want to view it many times. Read the information on the NAMA website describing how to borrow this CD and many others. For a small fee, NAMA-affiliated clubs and individual NAMA members may make one copy for their club or for individual use.

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The Good, the Bad, and the Deadly: Knowing the Poisonous Mushrooms, for Mushroom Hunters, Chefs, Parents, Pet Owners, & Medical Professionals, by Taylor Lockwood, is a very professional, well-researched, and comprehensive video on poisonous mushrooms and the toxicology of fungi. Not only is it accurate and informative, but we are also treated to his fabulous, beautiful photographs which illustrate the video. The main program is 50 minutes long; with extras, approximately an hour. It is available from the web site www.kingdomoffungi.com at a cost of $24.95 + postage.

The author's aim is to teach us about toxic mushrooms and their edible look-alikes. Like his previous excellent video, *The Mushroom Identification Trilogy*, this video is divided into three parts: Part I introduces poisonous mushrooms, warning against eating old mushrooms because they may be attacked by insects, bacteria, or slugs. If you think you may have mushroom poisoning, you should note the latency—which he defines as the time between eating a mushroom and the onset of symptoms of illness.

Part II covers basic mushroom identification. Taylor urges us to be observant and try to identify a mushroom from its cap, its spore-bearing surface, its stem, and base; the colors of the cap, the pore-bearing surface, the stem and the base; and any other identifying features such as a ring on the stem or the shape of the base. He suggests that we carefully study the habitat and make spore prints. These features are illustrated with many examples of toxic and edible mushrooms.

Part III, the longest part of the video, describes in detail and illustrates members of eight groups of toxins and the mushrooms that contain them. Taylor provides expert advice on cooking and eating mushrooms; counsel on how to avoid poisoning yourself and others (keep a fresh sample of any mushrooms that you are eating, in case you do become ill) and, in case you suspect a toxic reaction to mushrooms, the Poison Control Center phone number: (800) 222-1222.

If you do plan to eat wild mushrooms, use this video to learn which ones are toxic. Along with the video is a booklet in which Taylor cautions: "This program is presented for informational and educational purposes and not as a guide for mushroom edibility. Don't eat any mushroom based only upon what you see here. Always have a local expert show you what is good to eat and what is not." Wise words. Thank you, Taylor, for adding so much information to our knowledge of toxic and edible mushrooms.

—Sandy Sheine

Wildacres Was Wildly Great

by David Rust

As a first-time attender at the Wildacres Foray, I've got to say it was a blast! We really lucked out with weather: nine inches of rain the previous week had primed the forests to be awash with fungi.

The 1,600-acre Wildacres Retreat sits adjacent to the Blue Ridge Parkway and the Pisgah National Forest. The lush forests of Chestnut oak with a dense understory of rhododendron are an ideal place to rest and relax, hike, and hunt for mushrooms. No televisions or telephones are to be found—and cell phones work only in the middle of the parking lot on days without too much cloud cover. Wildacres is truly a retreat from our plugged-in routine.

Our first major expedition led to the top of Mount Mitchell, at 6,684 feet the highest peak on the East Coast, its uppermost habitat dominated by a spruce-fir forest. We picked our way down the Old Mitchell Trail and ventured off-trail into a dense thicket of red spruce on a steep, moss-covered, rocky habitat. We soon found that the downed logs were slippery, and standing deadwood made an unreliable support. Fungi were everywhere—and for a Californian each new discovery was unique and magical. Lactarius, Cortinarius, Tricholoma, Cantharellus, Russula, and Mycenas littered every nook and cranny of the slope. Baskets and tackle boxes soon filled, along with our camera's memory chips.

A weather station kiosk at the top of Mt. Mitchell says it is one of the coldest and windiest places in North America. When we hiked a bit of the other end of the Old Mitchell Trail near the restaurant, one of the staff said we were there on the "warmest day of the year."

Back at Wildacres, we carefully pulled out each treasure and filled the tables with our haul, turning our finds over to the mycologists to process. Juan Luis Mata, Jay Justice, and Coleman McCleneghan took over with microscopes, books, and keys to pursue identification. Debbie Viess, Charlotte Caplan, and Gabrielle Zeiger pitched into the process as well. At last count there were 226 species with 44 new on the list. As the hours passed, names were revealed: *Marasmius strictipes, Sparrasis spathulata, Pictoporellus betulina, Amanita brunnescens, Amanita flavorubens, Craterellus cinereus, Calostoma cinnabarinus, Heimioporus betula, Scleroderma citrinum, Grifola frondosa*, *Tapinella corrugata*, and more.

The foray provided lots of time for getting to know old and new friends. The Wildacres staff fed us good, hearty meals, and the rooms were very comfortable. Jay Justice gave a Friday presentation on statistics of fungi found at

Wildacres. His prediction of many new fungi species for the list was spot on. Dr. Mata gave a presentation on the various species of Shiitake. Kudos to Glenda O'Neal, who handled registration, and Allein Stanley, who seamlessly organized things on the ground. A good time was had by all!

Wildacres is a NAMA Regional Foray, ***open to all NAMA members,*** and is limited to 40 people. Be sure to sign up (early) next year.

Wildacres entrance sign and *Hemioporus betula* (below left) photographed by the author. Thanks to Debbie Viess for providing photos of *Stereum ostrea* (right), and *Tapinella corrugata* (below, right), collected by Todd Elliott in Painter's Gap, North Carolina.

Fungus in Bats, continued from page 1

Bats are important because most consume almost their body weight in insects daily. The reduction of the bat population has grave consequences to the ecosystem as the insects in their diet include many that are pests of forests, agriculture, and gardens as well as dangers to human health. As many as six species of bat, some of them endangered (the Indiana bat, the Virginia big-eared bat, and the gray bat), are in the areas affected.

Because of the grave impacts of bat deaths, Congress took action. The Department of Agriculture was given $250,000 to study the matter. This October the Department of the Interior was able to award grants totaling $800,000 to explore the cause and control of WNS, which has now killed more than an estimated one million bats in the Northeast.

Professor Tom Volk was part of the team that studied and finally identified the cause of syndrome. The technical report of the team is available in *Mycotaxon* (Vol. 108 pages 147–54). The fungus produces unusual curved conidia unlike previously studied species. After extensive study of the DNA and the literature, the team determined that the WNS fungus is an Ascomycota in the family Helotiaceae in the genus Geomyces. The new species of fungus has been named *Geomyces destructans*. The fungus is psychrophilic (cold-loving), which helps to explain why it is extensive in caves used by hibernating bats. More detail and access to the technical report are available through Tom Volk's website, www.TomVolkFungi.net.

Recent research suggests that a similar fungus has been found on the skin of European bats. While the cause of WNS appears to be *Geomyces destructans,* more study is needed to establish if the fungus is killing bats.

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Mushroom of the Month is back!

Cryptothecia rubrocincta is commonly called the Christmas lichen due to its spectacular red and green colors. The red often encircles the thallus of the lichen like a wreath. In fact, the epithet "rubrocincta" means "red wreath."

This beautiful lichen is found on the Gulf Coast of the United States, down thorough Mexico and Central America and into the tropics of South America. It can also be found on the coastal plain of Florida up through North Carolina. . . . It's really one of the most spectacular lichens to see.

The Christmas lichen here and its description were borrowed—with permission of Tom Volk—from his website, http://TomVolkFungi.net. Thanks, Tom!

Thanks to the GSMS for hosting the 2009 NAMA foray. Wishing all NAMA members, their families, and friends happy holidays! —The Editor